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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,606	11/25/2003	Chimsong Sul	10030224-1	5623

7590 05/11/2007
AGILENT TECHNOLOGIES, INC.
Intellectual Property Administration
Legal Department, DL 429
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EXAMINER

LEE, CHUN KUAN

ART UNIT	PAPER NUMBER
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2181

MAIL DATE	DELIVERY MODE
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05/11/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/721,606	SUL ET AL.	
	Examiner	Art Unit	
	Chun-Kuan (Mike) Lee	2181	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 March 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-7 and 12-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-7 and 12-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

CONTINUED EXAMINATION UNDER 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/03/2007 has been entered.

RESPONSE TO ARGUMENTS

2. Applicant's arguments filed 03/03/2007 for claims 2, 5-7 and 19-25 have been fully considered but they are not persuasive. Applicant's arguments with respect to claims 3-4 and 12-18 and 26 have been considered but are moot in view of the new ground(s) of rejection. Currently, claims 1 and 8-11 are canceled and claims 2-7 and 12-26 are pending for examination.

3. In response to applicant's arguments, on page 9, regarding claim 2 rejected under 35 U.S.C. 103(a) that the combination of references would not disclose the integrated circuit as recited in the claimed limitation, as one skilled in the art would replace the input pad 2 and the output pad 12 in Figure 1 with bidirectional pins of

Chennupati, such that the pad 2 and the pad 12 would be bidirectional pins; applicant's arguments have fully been considered, but are not found to be persuasive.

Chennupati teaches using a input pin and output pin for receiving and outputting signals respectively, and using a single bi-directional pin for input and output signals to pass through at different times, wherein the input pine and the output pins must be replaced by the single bi-directional pin in order to reduce the number of pins on the integrated circuit (IC) package and therefore reducing the size of package (Chennupati, col. 1, ll. 11-19), wherein the reduction of the number of pins would not be possible by replacing each respective input and output pins with the bi-directional pins, as stated by the applicant above, instead the number of pins would remain the same; therefore the replacement would be to replace the input and output pin with the single bi-directional. By applying such implementation towards AAPA the input pad 2 and the output pad 12 in Figure 1 would be replaced with the single bi-directional pad for inputting and outputting of signals.

As applicant applied the same arguments as stated above toward the independent claims 3, 12 and 19, the examiner also applies the same response towards each respective independent claims, such that the input pad 2 and the output pad 12 in Figure 1 would be replaced with the single bi-directional pad.

I. INFORMATION CONCERNING OATH/DECLARATION

Oath/Declaration

4. The applicant's oath/declaration has been reviewed by the examiner and is found to conform to the requirements prescribed in **37 C.F.R. 1.63**.

II. INFORMATION CONCERNING DRAWINGS

Drawings

5. The applicant's drawings submitted are acceptable for examination purposes.

III. REJECTIONS BASED ON 35 U.S.C. § 112

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 2 and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites the limitation "the I/O pin" in claim 2, lines 5 and 8. There is insufficient antecedent basis for this limitation in the claim.

Claim 7 recites the limitation "the first I/O pin" in claim 7, lines 3 and 5. There is insufficient antecedent basis for this limitation in the claim.

As per claim 2, it appears unclear which "I/O pin" the applicant is referring to. The examiner will assume "the pin" for the current examination.

As per claim 7, it appears unclear which "first I/O pin" the applicant is referring to. The examiner will assume "the pin" for the current examination.

IV. REJECTIONS BASED ON PRIOR ART

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 2, 5-7 and 12-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Chennupati (US Patent 6,833,728).

8. As per claim 2, AAPA teaches an integrated circuit comprising:

a plurality of pins (Drawings, Fig. 1, ref. 2, 12) including a input pin (Drawings, Fig. 1, ref. 2) and a output pin (Drawings, Fig. 1, ref. 12);

a scan path (Drawings, Fig. 1, ref. 9) having an input via the input pin and an output via the output pin (Drawings, Fig. 1); and

the scan path receiving input data for testing via the input pin and outputting the produced output data via the output pin (Specification, page 1, ll. 4-6).

AAPA does not teach the integrated circuit comprising:

the pin coupled to the input and the output of the scan path,

wherein:

the pin inputs scan test data to the scan path at a first test time; and

the pin outputs scan test data from the scan path at a second test time.

Chennupati teaches a system and a method comprising a single bi-directional pin (Fig. 1, ref. 152) is utilized for both inputting and outputting of data (col. 1, ll. 15-17 and col. 4, ll. 23-25), therefore the bi-directional pin have a data path for receiving data and another data path for output data (Fig. 1, ref. 156); wherein the data are clocked in and out of the bi-directional pin a different times (col. 1, ll. 15-17).

Chennupati is analogous art as one of ordinary skilled in the art would have found the teachings of Chennupati reasonably pertinent to the particular problem with which the applicants were concerned; because both the applicants, in paragraph 1 and Chennupati, in column 1, lines 10-14 recognizes that conventionally at least two pins were necessary on electronic devices, one pin for receiving input data and one pin for transmitting output data. Chennupati goes on to teach that one of the known method of overcoming the need for separate pins for input and output data is to use a single bi-directional pin for receiving and transmitting both input and output data.

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include Chennupati's bi-directional pin into AAPA's pins. The resulting combination of the references further teaches the integrated circuit further comprising:

the bi-directional pin is utilized for input and output of data, such that the bi-directional pin is coupled to the input and the output of the scan path:

wherein:

the bi-directional pin inputs data for testing to the scan path during the first period of time and outputs the produced output data from the scan path during the second period of time, as the inputting and the outputting of data are implemented at different period of times.

The suggestion/motivation for doing so would have been for the benefit of reducing the number pins or allow additional pins to be used for other purposes (Chennupati, col. 5, ll. 34-37).

Therefore, it would have been obvious to combine Chennupati with AAPA for the benefit of reducing the number pins or allow additional pins to be used for other purposes to obtain the invention as specified in claim 2.

9. As per claim 5, AAPA and Chennupati teach all the limitations of claim 2 as discussed above, where Chennupati further teaches the integrated circuit further comprising wherein the scan path comprises a series of scan paths (Chennupati, Fig. 2 and col. 5, ll. 38-44), wherein the first of the series of scan path is the path for the transferring of write data into the memory and the second of the series of scan path is the path for the outputting of the read data from the memory.

10. As per claim 6, AAPA and Chennupati teach all the limitations of claim 2 as discussed above, where Chennupati further teaches the integrated circuit further comprising functional circuitry (Chennupati, memory 204 of Fig. 2), wherein the scan

path interacts with the functional circuitry (Chennupati, Fig. 2 and col. 5, ll. 38-44), wherein data are transferred to and from the memory through the scan path; and

11. As per claim 7, AAPA and Chennupati teach all the limitations of claim 2 as discussed above, where Chennupati further teaches the integrated circuit further comprising functional circuitry (Chennupati, memory circuit of memory 204 of Fig. 2) wherein:

the pin inputs functional test data (write data) to the functional circuitry (e.g. memory circuit of memory) at a third test time (Chennupati, Fig. 2 and col. 5, ll. 38-44), as the subsequent write data is send through the L0 bus line to the first I/O pin of the memory following the second test time; and

the pin outputs functional test data (read data) from the functional circuitry (e.g. memory circuit of memory) at a forth test time (Chennupati, Fig. 2 and col. 5, ll. 38-44), as the subsequent read data is outputted by the memory, to the L0 bus line, through the first I/O pin following the third test time.

12. As per claim 12, AAPA teaches an integrated circuit comprising:

a functional circuit (Drawings, Fig. 1, ref. 5) producing functional output (Specification, page 1, ll. 25-31);

a I/O pin (Drawings, Fig. 1, ref. 2) that acts as input at a first time (Specification, page 1, ll. 5-8);

an I/O circuitry comprising:

a virtual pin multiplexer (Drawings, Fig. 1, ref. 7) coupled to (1) the functional circuit (Drawings, Fig. 1, ref. 5) to received the functional output and (2) the scan path (Drawings, Fig. 1, ref. 9) to receive the scan output, the virtual pin multiplexer providing a virtual pin multiplexer output (Specification, p. 1, ll.18-22), wherein the virtual pin multiplexer output outputs to a output logic (Fig. 1, ref. 11); and

a D flip-flop (Fig 3, ref. 17) coupled to the (1) receiving of the scan output data (Fig. 3, ref. 8) and (2) outputting the data through the corresponding output (Fig. 3, ref. 18), wherein the D flip-flop holds the received data for a clock cycle (Specification, p. 2, ll. 20-26)

AAPA does not teach the integrated circuit comprising the I/O circuitry comprising:

the I/O pin acting as both input and output and having a respective scan path that produces scan output;

an input buffer coupled to (1) the I/O pin to receive input signal and (2) to the functional circuit to provide the input signal;

a virtual pin output buffer to the I/O pin to provide output; and

a virtual pin flip-flop coupled to the (1) virtual pin multiplexer to receive the virtual pin multiplexer output and (2) the virtual pin output buffer to provide the virtual pin multiplexer output, the virtual pin flip-flop holding the received for a clock cycle.

Chennupati teaches a system and a method comprising:

a single bi-directional pin (Fig. 1, ref. 152) is utilized for both inputting and outputting of data (col. 1, ll. 15-17 and col. 4, ll. 23-25) and the data is inputted into a device (Fig. 1, ref. 150) through a respective INPUT2 data path and outputted from the device through a respective OUTPUT2 data path (Fig. 1, ref. 156), wherein the received INPUT2 data would have been processed by other components in the device to generate the OUTPUT2 data to be outputted (Fig. 1 and col. 4, ll. 27-29) wherein the data are clocked in and out of the bi-directional pin a different times (col. 1, ll. 15-17);

a input buffer (Fig. 1, ref. 164) coupled to the bi-directional pin (Fig. 1, ref. 152) to receive input data and to forward the data the circuitry within the device (Fig. 1, ref. 150) to provide the INPUT2 (Fig. 1); and

an output buffer (Fig. 1, ref. 154) coupled to the bi-directional pin (Fig. 1, ref. 152) to provide OUTPUT2 (Fig. 1).

Chennupati is analogous art because Chennupati invention is reasonably pertinent to the particular problem with which the applicant was concerned, as the Chennupati's bi-directional pin will enable the doubling of the number of scan path as each bi-directional is utilized for both input and output of data.

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include Chennupati's bi-directional pin into AAPA's pins. The resulting combination of the references further teaches the integrated circuit comprising:

the bi-directional pin (e.g. I/O pin) receiving input data during the first time and outputting data during the second time, the bi-directional pin having the respective scan path to produce the OUTPUT2 (e.g. scan output);

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the I/O circuitry, comprising:

the input buffer coupled to the bi-directional pin to receive input data and to the functional circuit to provide the INPUT2;

the output buffer coupled to the bi-directional pin to provide the OUTPUT2;

the D flip-flop coupled to the output of the virtual pin multiplexer to receive the scan output data and to the output buffer for via the output for outputting of the data received from the virtual pin multiplexer, wherein the D flip-flop holds the received data for a clock cycle.

The suggestion/motivation for doing so would have been for the benefit of reducing the number pins or allow additional pins to be used for other purposes (Chennupati, col. 5, ll. 34-37).

Therefore, it would have been obvious to combine Chennupati with AAPA for the benefit of reducing the number pins or allow additional pins to be used for other purposes to obtain the invention as specified in claim 12.

13. As per claim 13, AAPA and Chennupati teach all the limitation of claim 12 as discussed above, where both further teach the integrated circuit further comprising:

a number of scan paths (Chennupati, Fig. 2 and col. 5, ll. 38-44) as each of the plurality of bus lines have the corresponding scan path resulting in four scan path;

the same number of I/O pins (Chennupati, Fig. 2 and col. 5, ll. 38-44) as there are four I/O pads connected to the corresponding bus line; and

the same number of I/O circuitry, wherein the same number of virtual pin of flip-flops (AAPA, Drawings, Fig. 2 and Fig. 3, ref. 17) form at least one register, as each of the I/O pad is coupled to the corresponding I/O circuitry with the D flip-flop, therefore the combined plurality of D flip-flops forms the at least one register.

14. As per claim 14, AAPA and Chennupati teach all the limitation of claim 13 as discussed above, where AAPA further teaches the integrated circuit further comprising:

each virtual pin flip flop (AAPA, Drawings, D flip-flop 17 of Fig. 3) comprising:

a compact-control signal (AAPA, Drawings, mask signal 13 of Fig. 3);

an output-data signal (AAPA, Drawings, scan output data (SOD) 8 of Fig.

3); and

an AND-gate (AAPA, Drawings, Fig. 3, ref. 15) receiving the compact-

control signal (AAPA, Drawings, Fig. 3, ref. 13) and the output-data

signal (AAPA, Drawings, Fig. 3, ref. 8) to eliminate the output of data

with don't-care nature (AAPA, Specification, page 2, ll. 20-25), as the

AND-gate is utilized to eliminate the output of data with don't-care

nature; and

the register is a compaction register (AAPA, Drawings, Fig. 2, and Specification, page 2, ll. 1-5), as each of the I/O pads is operable for both inputting scan input data (SID) and outputting scan output data (SOD), therefore it would have been obvious to implement the compactor at the I/O pads for outputting and utilizing the register as compaction register.

15. As per claim 15, AAPA and Chennupati teach all the limitation of claim 13 as discussed above, where AAPA further teaches the integrated circuit comprising wherein each I/O circuitry further comprises:

a reseed multiplexer (AAPA, Drawings, Fig. 4, ref. 25) receiving the scan output data (AAPA, Drawings, scan output data 28 of Fig. 4) from the scan path and scan input (AAPA, Drawings, Fig. 4, ref. 23) derived from the input buffer, the reseed multiplexer obviously provides the scan output or the scan input to the virtual pin multiplexer (AAPA, Drawings, Fig. 1, ref. 7);

a reseed control signal controlling the reseed multiplexer (AAPA, Specification, page 2, l. 31 to page 3, l. 3), wherein the reseed multiplexer is multiplexing input data between the scan input data and the output of the XOR-gate (AAPA, Drawings, Fig. 4, ref. 29), therefore the reseed control signal is required to determine which of the input is to be outputted to the D flip-flop (AAPA, Drawings, Fig. 4, ref. 20); and

the register is a reseed register (AAPA, Specification, page 2, l. 27 to page 3, l. 3) as the register is utilized for reseeding.

16. As per claim 16, AAPA and Chennupati teach all the limitation of claim 13 as discussed above, where AAPA further teaches the integrated circuit comprising wherein:

each I/O circuitry further comprises

an XOR-gate (AAPA, Drawings, Fig. 4, ref. 29) coupled to receive a linear feedback shift register (LFSR) input (AAPA, Drawings, Fig. 4, ref. 27) and a LFSR feedback (AAPA, Drawings, Fig. 4, ref. 28), the XOR-gate providing an XOR-gate output (Fig. 4 and Specification, page 3, ll. 1-3);

a reseed multiplexer (AAPA, Drawings, Fig. 4, ref. 25) coupled to receive (1) the XOR-gate output (AAPA, Drawings, output of XOR-gate 29 of Fig. 4) and (2) scan input (AAPA, Drawings, Fig. 4, ref. 23), the reseed multiplexer providing a reseed multiplexer output (Fig. 4);

a reseed flip-flop (AAPA, Drawings, Fig. 4, ref. 20) coupled to receive the reseed multiplexer output (i.e. from the reseed multiplexer 25 of Fig. 4, AAPA, Drawings), the reseed flip-flop providing a reseed flip-flop output (AAPA, Drawings, Fig. 4, ref. 26); and

a input multiplexer (AAPA, Drawings, Fig. 4, ref. 22) coupled to receive the input signal (AAPA, Drawings, Fig. 4, ref. 21) and the reseed flip-flop output (AAPA, Drawings, Fig. 4, ref. 26), the input multiplexer generating the scan input (AAPA, Drawings, Fig. 4, ref. 23).

17. As per claim 17, AAPA and Chennupati teach all the limitation of claim 13 as discussed above, where AAPA further teaches the integrated circuit comprising:

a second number of flip-flops (AAPA, Drawings, Fig. 3, ref. 17) that form a compaction register wherein:

the integrated circuit performs reseeding and compaction at the same time (AAPA, Specification, page 1, l. 29 to page 3, l. 3), wherein the reseeding and

compaction are performed by the different number of flip-flops (AAPA, Drawings, Fig. 3, ref. 17 and Fig. 4, ref. 20).

18. As per claim 18, AAPA and Chennupati teach all the limitation of claim 17 as discussed above, where AAPA further teaches the integrated circuit comprising wherein the compaction register is read serially (AAPA, Specification, page 1, ll. 7-9), as shifting of data is implemented serially.

19. As per claim 19, AAPA teaches a method comprising:

inputting scan data to a first I/O pin (Drawings, Fig. 1, ref. 2) during a first time (Specification, page 1, ll. 5-8);

processing the scan data in a scan path to produce scan output data (Specification, page 1, ll. 8-9); and

outputting the scan output data to a second I/O pin (Drawings, Fig. 1, ref. 12) at a second time (Specification, page 1, ll. 5-8).

AAPA does not teach the method comprising wherein the input and the output of data are transferred over the same I/O pin as the scan data is processed in a respective scan path.

Chennupati teaches a system and a method comprising a single bi-directional pin (Fig. 1, ref. 152) is utilized for both inputting and outputting of data (col. 1, ll. 15-17 and col. 4, ll. 23-25), wherein input data to be processed is received through the respective

INPUT2 data path, and after processing, output data is outputted through the respective OUTPUT2 data path (Fig. 1, ref. 156).

Chennupati is analogous art because Chennupati invention is reasonably pertinent to the particular problem with which the applicant was concerned, as the Chennupati's bi-directional pin will enable the doubling of the number of scan path as each bi-directional is utilized for both input and output of data.

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include Chennupati's bi-directional pin into AAPA's pins. The resulting combination of the references teaches the integrated circuit further comprising the bi-directional I/O pins for receiving scan data to be processed in the respective scan path, and after processing to obtain the scan output data, scan output data is output through said bi-directional I/O pins at the second time.

The suggestion/motivation for doing so would have been for the benefit of reducing the number pins or allow additional pins to be used for other purposes (Chennupati, col. 5, ll. 34-37).

Therefore, it would have been obvious to combine Chennupati with AAPA for the benefit of reducing the number pins or allow additional pins to be used for other purposes to obtain the invention as specified in claim 2.

20. As per claim 20, AAPA and Chennupati teach all the limitation of claim 19 as discussed above, where AAPA further teaches the method comprising:

multiplexing output data (AAPA, Drawings, Fig. 1, ref. 6) and scan output data (AAPA, Drawings, Fig. 1, ref. 10) by utilizing a multiplexer (Fig. 1, ref. 7); and storing the output data or scan output data in a flip-flop (AAPA, Drawings, D flip-flop 17 of Fig. 3) during the first time, as data is buffered in the flop-flop before outputting during the second time.

21. As per claim 21, AAPA and Chennupati teach all the limitation of claim 20 as discussed above, where both further teach the method comprising:

connecting a number of flip-flops (AAPA, Drawings, D flip-flop 17 of Fig. 3 and D flip-flop 20 of Fig. 4) associated with I/O pins; and

forming a register (AAPA, Drawings, D flip-flop 20 of Fig. 4) for performing a reseed test (AAPA, Specification, page 2, l. 27 to page 3, l. 3 and Chennupati, Fig. 2), wherein there are four I/O pins and each is connected to the corresponding D flip-flop (AAPA, Drawings, Fig. 4, ref. 20) to form the register for implementing reseeding test.

22. As per claim 22, AAPA and Chennupati teach all the limitation of claim 21 as discussed above, where AAPA further teaches the method comprising wherein forming a register further comprises:

sending a compact control signal (AAPA, Drawings, mask signal 13 of Fig. 3); AND-gating (AAPA, Drawings, AND-gate 15 of Fig. 3) the compact control signal with the output data (AAPA, Drawings, scan output data (SOD) 8 of Fig. 3);

eliminating don't care data (AAPA, Specification, page 2, ll. 14-26), wherein the AND-gate is utilized to eliminate the don't care data; and
performing compaction (AAPA, Drawings, Fig. 2-3).

23. As per claim 23, AAPA and Chennupati teach all the limitation of claim 21 as discussed above, where AAPA further teaches the method comprising wherein forming a register further comprises:

sending a reseed control signal to a reseed multiplexer (AAPA, Drawings, Fig. 4, ref. 25), wherein the reseed multiplexer is multiplexing between two inputs, therefore there must be the corresponding reseed control signal controlling the reseed multiplexer to select between the two input signals;

multiplexing functional output data (AAPA, Drawings, Fig. 4, ref. 28) and scan input data (AAPA, Drawings, Fig. 4, ref. 23); and

performing the reseed test (AAPA, Specification, page 2, l. 27 to page 3, l. 3).

24. As per claim 24, and Chennupati teach all the limitation of claim 23 as discussed above, where AAPA further teaches the method comprising wherein multiplexing further comprises:

receiving gated input from a linear feedback shift register (AAPA, Drawings, Fig. 4, ref. 27) as the output from the linear feedback shift register is inputted into the XOR-gate, to be multiplexed by the reseed multiplexer; and

performing a linear feedback shift register reseed test (AAPA, Specification, page 2, l. 27 to page 3, l. 3), as the scan output data is feedback to the register.

25. As per claim 25, AAPA and Chennupati teach all the limitation of claim 19 as discussed above, where Chennupati further teaches the method comprising wherein the first time and the second time occur during the same clock cycle (Chennupati, col. 1, ll. 26-28), as the port can simultaneous transmit and receive input and output signal, therefore the inputting and the outputting of data can be implemented over the same clock cycle.

26. As per claim 26, AAPA and Chennupati teach all the limitation of claim 12 as discussed above, where Chennupati further teach the integrated circuit further comprising an output buffer (Chennupati, Fig. 1, ref. 154) coupled to (1) the functional circuit to received the functional output (Chennupati, Fig. 1, ref. OUTPUT2) and (2) the I/O pin (Chennupati, Fig. 1, ref. 152) to provide the function output (Chennupati, Fig. 1, ref. OUTPUT2).

27. Claim 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Chennupati (US Patent 6,833,728) and Herzel (US Patent 6,271,732).

28. As per claim 3, AAPA teaches an integrated circuit, comprising:
a scan path (Drawings, Fig. 1, ref. 9);

inputting scan test to an input of the scan path via a inputting pin (Drawings, Fig. 1, ref. 2) (Specification, p. 1, ll. 4-12); and

outputting scan test data from the scan path via a outputting pin (Drawings, Fig. 1, ref. 12) (Specification, p. 1, ll. 4-12).

AAPA does not teach the integrated circuit, comprising

two separate scan path;

a first I/O pin inputting input scan test to an input of the first scan path at a first test time and outputting output scan test data from an output of the second scan path at a second test time; and

a second I/O pin inputting input scan test to an input of the second scan path at a first test time and outputting output scan test data from an output of the first scan path at a second test time.

Chennupati teaches a system and a method comprising

a plurality of single bi-directional pin (Fig. 1, ref. 152 and Fig. 2) is utilized for both inputting and outputting of data (col. 1, ll. 15-17 and col. 4, ll. 23-25), therefore the bi-directional pin have a data path for receiving data (Fig. 1, ref. 164) and another data path for output data (Fig. 1, ref. 156); wherein the data are clocked in and out of the bi-directional pin a different times (col. 1, ll. 15-17);

a first bi-directional pin (e.g. pin coupled to line L0 of Fig. 2) inputting data into the memory (Fig. 2, ref. 204) at during a first period of time (e.g. WRITE 0 of Fig. 2) and outputting data from memory (Fig. 2, ref. 204) during a second period of time (e.g.

READ 0 of Fig. 2), as data are clocked in and out of the bi-directional pin a different times; and

a second bi-directional pin (e.g. pin coupled to line L1 of Fig. 2) inputting data into the memory (Fig. 2, ref. 204) at during the first period of time (e.g. WRITE 1 of Fig. 2) and outputting data from memory (Fig. 2, ref. 204) during the second period of time (e.g. READ 1 of Fig. 2), as data are clocked in and out of the bi-directional pin a different times.

Chennupati is analogous art because Chennupati invention is reasonably pertinent to the particular problem with which the applicant was concerned, as the Chennupati's bi-directional pin will enable the doubling of the number of scan path as each bi-directional is utilized for both input and output of data.

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include Chennupati's bi-directional pin into AAPA's pins. The resulting combination of the references further teaches the integrated circuit, comprising:

the first scan path coupled between the input and the out of the first bi-directional pin, as the scan test data is inputted into the first scan path during the first period of time and outputted from the first scan path during the second period of time; and

the second scan path coupled between the input and the out of the second bi-directional pin, as the scan test data is inputted into the second scan path during the first period of time and outputted from the second scan path during the second period of time.

The suggestion/motivation for doing so would have been for the benefit of reducing the number pins or allow additional pins to be used for other purposes (Chennupati, col. 5, ll. 34-37).

Therefore, it would have been obvious to combine Chennupati with AAPA for the benefit of reducing the number pins or allow additional pins to be used for other purposes to obtain the invention as specified in claim 3.

Herzel teaches an integrated circuit comprising:
a first circuit component (Fig. 1, ref. 10a);
wherein the first circuit component's upper input (Fig. 1, ref. 10a input "+") which is located on the upper data path would be outputted by the first circuit component's lower output (Fig. 1, ref. 10b output "+") which is located on the lower data path; and
wherein the first circuit component's lower input (Fig. 1, ref. 10a input "-") which is located on the lower data path would be outputted by the first circuit component's upper output (Fig. 1, ref. 10b output "-") which is located on the upper data path.

AAPA and Herzel are analogous art because they are from the same field of endeavor as they are both associated with integrated circuitry.

It would have been obvious to one of ordinary skill in this art, at the time of invention was made to include Herzel's circuitry into AAPA and Chennupati's integrated circuit. The resulting combination of the references further teaches the integrated circuit comprising.

the first bi-directional pin receiving the scan test data into the first scan path during the first period of time and outputting from the second scan path during the second period of time; and

the second bi-directional pin inputting the scan test data into the second scan path during the first period of time and outputting from the first scan path during the second period of time.

The suggestion/motivation for doing so would have been to enable AAPA to test various types of circuits, including Herzel's circuit component.

Therefore, it would have been obvious to combine Herzel with AAPA for the benefit of enabling to test a diversity of different types of circuits to obtain the invention as specified in claim 3.

29. As per claim 4, AAPA and Chennupati teach all the limitations of claim 3 as discussed above, where Chennupati further teaches the integrated circuit comprising wherein at least one of the first scan path and the second scan path further comprises a series of scan paths (Chennupati, Fig. 2 and col. 5, ll. 38-44), wherein the first of the series of scan path is the path for the transferring of write data into the memory and the second of the series of scan path is the path for the outputting of the read data from the memory.

V. CLOSING COMMENTS

Conclusion

a. STATUS OF CLAIMS IN THE APPLICATION

The following is a summary of the treatment and status of all claims in the application as recommended by M.P.E.P. 707.07(i):

a(1) CLAIMS REJECTED IN THE APPLICATION

Per the instant office action, claims 2-7 and 12-26 have received a first action on the merits and are subject of a first action non-final

b. DIRECTION OF FUTURE CORRESPONDENCES

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chun-Kuan (Mike) Lee whose telephone number is (571) 272-0671. The examiner can normally be reached on 8AM to 5PM.

IMPORTANT NOTE

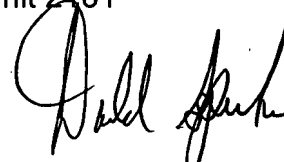
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2181

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

May 07, 2007

Chun-Kuan (Mike) Lee
Examiner
Art Unit 2181

A handwritten signature in black ink, appearing to read "Donald Sparks", is written over the printed name.

DONALD SPARKS
SUPERVISORY PATENT EXAMINER